High-density Signal Conditioners 10-RACK

2-input MATH FUNCTION MODULE
(field-programmable)

Functions & Features
• Providing temperature or pressure compensation for a gas flow, and other arithmetic operations
• Microprocessor based
• Equation and parameters selectable on site via hand-held programmer PU-2x
• Loop testing
• Optional second channel output available at the front terminals and at the Standard Rack connector

Typical Applications
• Various flowmeters
• Adding two flows
• Ratio calculation
• Calculating average temperature
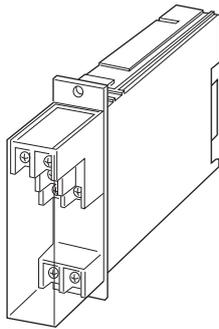
MODEL: 10JF-[1][2][3]-R[4]

ORDERING INFORMATION
• Code number: 10JF-[1][2][3]-R[4]
Specify a code from below for each of [1] through [4].
  (e.g. 10JF-6A6-R/3/Q)
• Parameters
Use Ordering Information Sheet (No. ESU 1980). Default setting will be used if not otherwise specified.
  ($K_0 = 1$, $K_1 = 1$, $K_2 = 1$, $A_0 = 0$ %, $A_1 = 0$ %, $A_2 = 0$ %)
• Specify the specification for option code /Q
  (e.g. /C01)

[1] INPUT
Current
A: 4 – 20 mA DC (Input resistance 100 Ω)
Voltage
6: 1 – 5 V DC (Input resistance 1 MΩ min.)

[2] OUTPUT 1
Current
A: 4 – 20 mA DC (Load resistance 600 Ω max.)
Voltage
6: 1 – 5 V DC (Load resistance 500 Ω min.)

[3] OUTPUT 2
0: None
Voltage
6: 1 – 5 V DC (Load resistance 5000 Ω min.)

POWER INPUT
DC Power
R: 24 V DC
(Operational voltage range 24 V ±10 %, ripple 10 %p-p max.)

[4] OPTIONS (multiple selections)
Equation (Refer to the EQUATION table)
/1: Temperature compensation for DP flowmeter (ideal gas)
/2: Pressure compensation for DP flowmeter (ideal gas)
/3: Addition/subtraction
/4: Multiplication
/5: Division
Other Options
blank: none
/Q: Option other than the above (specify the specification)

SPECIFICATIONS OF OPTION: Q
COATING (For the detail, refer to our web site.)
/C01: Silicone coating
/C02: Polyurethane coating
/C03: Rubber coating

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EQUATION

Equation parameters

X_0: output (%)

X_1 to X_2: input (%)

K_0 to K_2: gain ±29.999

A_0 to A_2: bias (%) ±299.99 %

EQUATION

/1: Temperature compensation for DP flowmeter (ideal gas)

$$X_0 = \frac{K_1 X_1}{\sqrt{K_2 X_2 + A_2}}$$

where X_0 : compensated flow (linear characteristic)

X_1 : uncompensated flow (square root extraction available)

X_2 : temperature

/2: Pressure compensation for DP flowmeter (ideal gas)

$$X_0 = K_1 X_1 \sqrt{K_2 X_2 + A_2}$$

where X_0 : compensated flow (linear characteristic)

X_1 : uncompensated flow (square root extraction available)

X_2 : pressure

/3: Addition/subtraction

$$X_0 = K_0 \{K_1 (X_1 + A_1) + K_2 (X_2 + A_2)\} + A_0$$

/4: Multiplication

$$X_0 = K_0 (K_1 X_1 + A_1)(K_2 X_2 + A_2) + A_0$$

/5: Division

$$X_0 = \frac{K_0 (K_1 X_1 + A_1)}{(K_2 X_2 + A_2)} + A_0$$

RELATED PRODUCTS

• Programming Unit (model: PU-2x)

• PC configurator software (model: JXCON)

Downloadable at our web site.

A dedicated cable is required to connect the module to the PC. Please refer to the internet software download site or the users manual for the PC configurator for applicable cable types.

GENERAL SPECIFICATIONS

Construction: Rack-mounted; terminal access via screw terminals at the front and via card-edge connector at the rear; terminal cover provided

Connection

Input: M3.5 screw terminals (torque 0.8 N·m)

Output: Card-edge connector and M3.5 screw terminals (torque 0.8 N·m)

Power input: Supplied from card-edge connector

Screw terminal: Nickel-plated steel

Housing material: Flame-resistant resin (black)

Isolation: Input to output 1 to output 2 to power (non-isolated between inputs)

Overrange input: Approx. -25 to +125 %

Overrange output: Approx. -10 to +120 % at 1 – 5 V

Adjustments: Programming Unit (model: PU-2x); equation and parameters, square root extraction, zero and span, etc. (Refer to the users manual of JXCON for the adjustments configurable with JXCON.)

INPUT SPECIFICATIONS

■ **DC Current**: Input resistor incorporated

INSTALLATION

Current consumption: Approx. 60 mA with voltage output 1

Approx. 90 mA with current output 1

Operating temperature: -5 to +55°C (23 to 131°F)

Operating humidity: 30 to 90 %RH (non-condensing)

Mounting: Standard Rack 10BXx

Weight: 220 g (0.49 lb)

PERFORMANCE in percentage of span

Accuracy: Input accuracy + output accuracy

Input accuracy: ±0.2 % (gain ≤ 1)

[±0.2 % × gain] with gain > 1

Output accuracy: ±0.2 %

Temp. coefficient: ±0.015 %/°C (±0.008 %/°F)

Response time: ≤ 1.2 sec. (0 – 90 %)

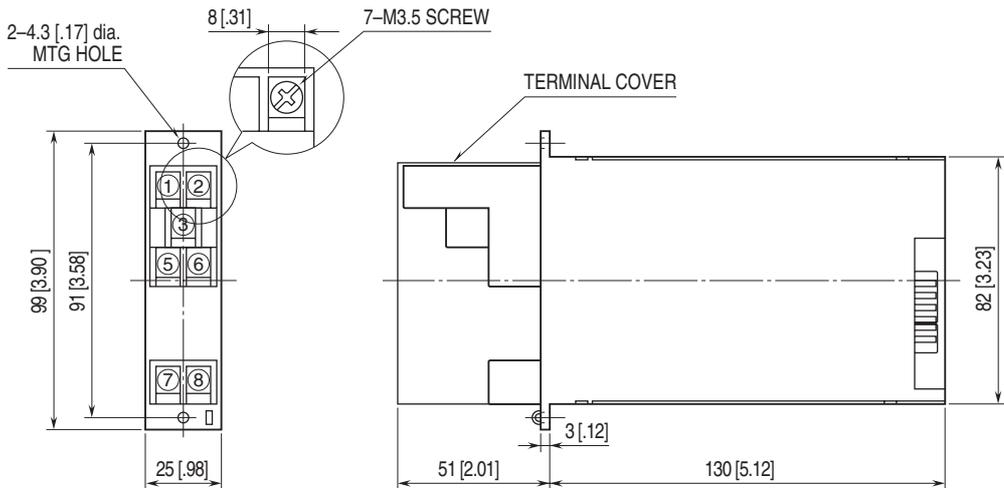**Line voltage effect**: ±0.1 % over voltage range

Insulation resistance: ≥ 100 MΩ with 500 V DC
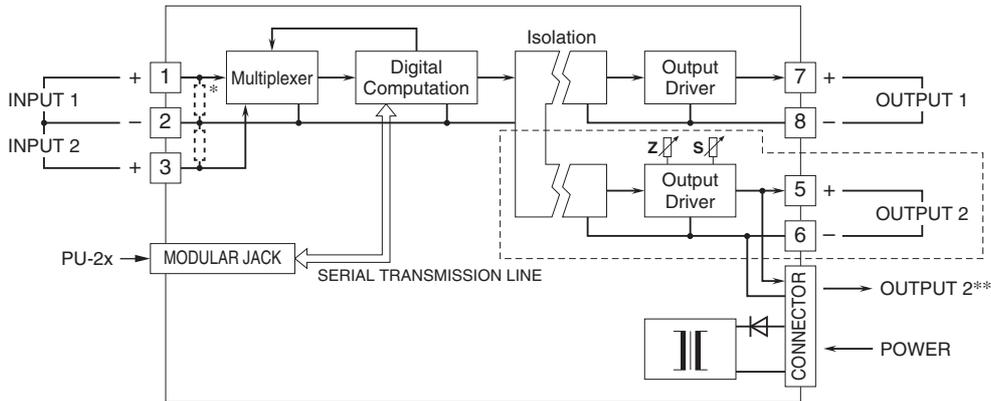
Dielectric strength: 500 V AC @ 1 minute

(input to output 1 to output 2 to power)

1500 V AC @ 1 minute (input or output or power to ground)

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EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS   unit: mm [inch]

2–4.3 [.17] dia.
MTG HOLE

8 [.31]

7–M3.5 SCREW

TERMINAL COVER

99 [3.90]
91 [3.58]
82 [3.23]

1 2
3
5 6
7 8

25 [.98]

51 [2.01]   130 [5.12]   3 [.12]

SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

INPUT 1
INPUT 2

1 +
2 −
3 +

Multiplexer

Digital
Computation

Isolation

Output
Driver

7 +
8 −   OUTPUT 1

z   s

Output
Driver

5 +
6 −   OUTPUT 2

PU-2x → MODULAR JACK

SERIAL TRANSMISSION LINE

CONNECTOR → OUTPUT 2**
← POWER

* Input shunt resistor incorporated for current input.
**1 output type has the output 1 connected to the card-edge connector in parallel.
Note: The section enclosed by broken line is only for 2nd output channel.

⚠ Specifications are subject to change without notice.